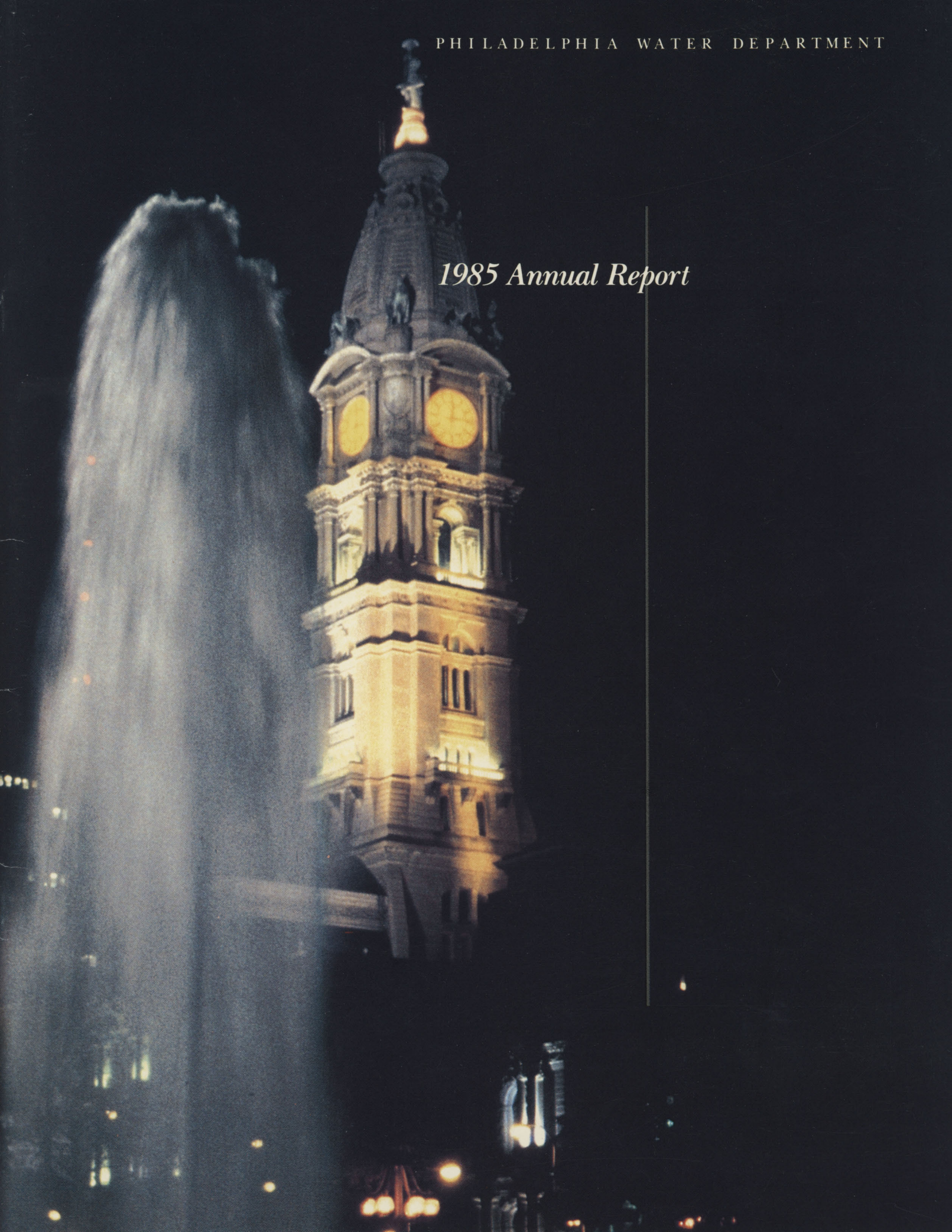
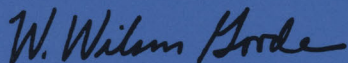


*1985 Annual Report*

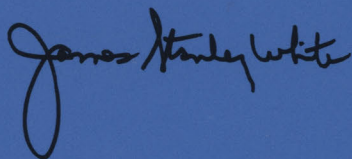


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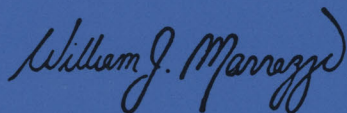
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W. Wilson Goode  
Mayor



James Stanley White  
Managing Director



William J. Marrazzo  
Water Commissioner

### *Front cover:*

*The beautiful fountain in JFK Plaza Square and City Hall's illuminated tower are Philadelphia landmarks.*

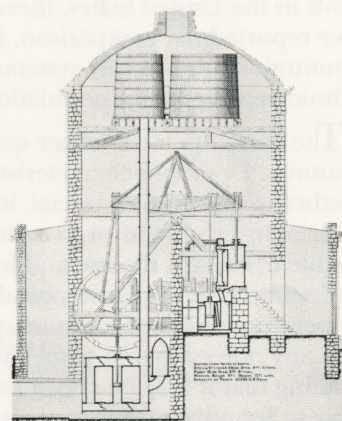
## Developing Safe Water Supplies

The total supply of water on earth is exactly the same as it was three billion years ago. Because water appears to be so plentiful and inexpensive, it has been taken for granted and, consequently, wasted and abused. But our lives depend on it. The human body is 70 percent water. Without water, there is no life. This colorless, clear liquid covers almost three-fourths of the earth's surface. Of this, 97 percent is saltwater and two percent is stored in glaciers and ice caps. The remaining one percent left in freshwater rivers, lakes, and underground reservoirs ought to be enough for all of us.

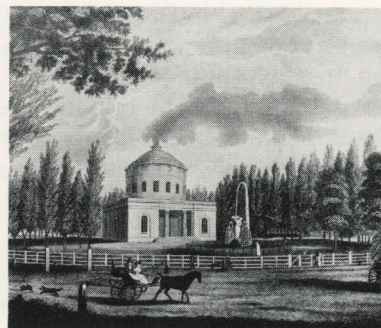
Today's water concerns are those of distribution and quality rather than supply. Water is either not in the right place or not pure enough to drink. The media brings new crises to our attention, almost on a daily basis: a drought in North Africa, toxic waste dumps contaminating groundwater, acid rain destroying Adirondack Mountain lakes, further links between water quality and health as medical research advances. Although today's problems are increasingly complex, mankind's interest in an abundant and pure water supply dates back to the beginning of our existence on earth.

Historically, fertile river valleys were the centers of civilization. Public water supplies, already developed in ancient times, assumed added importance with the increase in urbanization. Although they clearly were beneficial in distributing water of uniform quality, large numbers of people were at risk if those supplies were contaminated. The first real proof that public water supplies could be a source of infection to humans was based on careful epidemiological studies of cholera in London by Dr. John Snow in 1854. In 1892, an epidemic of cholera struck the citizens of Hamburg, Germany, who drank unfiltered water from the Elbe River. Just across the river in Altona, where the water supply was filtered through sand, the residents remained healthy.

Many harmful germs, such as those that cause typhoid, are too small to be eliminated by filters. Other organisms may multiply even after filtration. Chlorine, the most widely used drinking water disinfectant in the world, helps to stop these threats to health. In 1908, Jersey City and Chicago became the first cities in the United States to use chlorine for continuous disinfection, followed by Poughkeepsie and Philadelphia, in 1909.



*The Centre Square Works, one of two steam-powered water pumping stations opened in 1801, was built on the site where City Hall now stands!*



*Steam power raised water 40 feet to two wooden tanks which held 17,660 gallons, at Centre Square.*

The improvement of public water supplies has been the most significant factor in the dramatic decline of typhoid, cholera and dysentery. In 1900, when there were no more than ten water filtration plants in the United States, there were 35,379 deaths from typhoid fever reported. By comparison, in 1982, with more than 65,000 community water supply systems, there were only 425 cases of typhoid reported, in a population three times that of 1900.

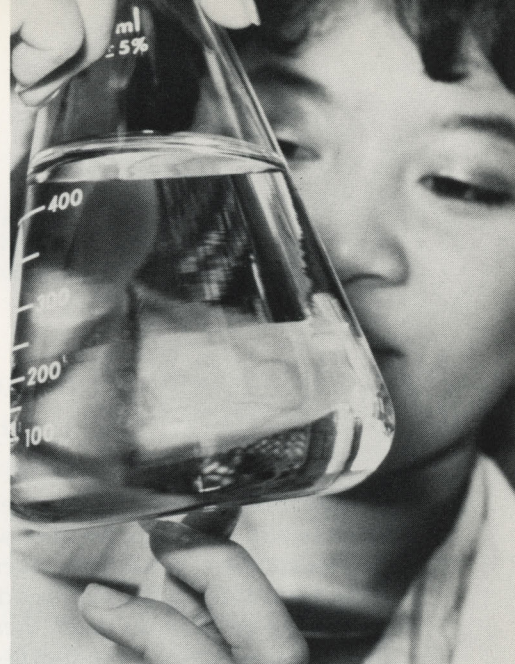
The common term "water quality" has a wide spectrum of meanings. Desirable characteristics of water can vary depending on whether its use is commercial, industrial or recreational. Water for drinking and food preparation must be free from organisms capable of causing disease and from minerals and organic substances producing adverse physiological effects. It should have a reasonable temperature and be free from apparent turbidity, color, odor, and from any objectionable taste. Such water is termed "potable," meaning that it may be consumed in any desired amount without concern for adverse effects on health.

### *Drinking Water Standards*

When the United States Environmental Protection Agency (EPA) was established in December 1970, it assumed responsibility for setting and enforcing federal drinking water regulations and revising the 1962 United States Public Health Service standards. The revision served as the basis for the interim primary regulations developed under the 1974 Safe Drinking Water Act. They are called "interim" regulations because research continues on drinking water contaminants.

The 1974 Act directed EPA to issue national Primary Drinking Water Regulations for all public water systems throughout the United States having at least 15 service connections or regularly serving at least 25 people. The drinking water regulations in the Act are of two types: primary and secondary. Primary regulations protect public health, and take cost into consideration. Secondary regulations protect public welfare, and concern taste, odor, and appearance of drinking water.

The interim primary regulations, that became effective in 1977, set maximum contaminant levels (MCLs) for organic and inorganic chemicals, radionuclides, bacteria, and maximum turbidity of water. They also set the minimum number of times drinking water systems must be sampled to comply with monitoring requirements. In the meantime, the National Academy of Sciences is conducting an ongoing study on the health effects of drinking water contaminants. This study will form the basis for the revised primary regulations.



*Skilled chemists and technicians examined 22,000 samples of water in 1985, to ensure water quality.*



## *Today's Assurance of Quality*

The \$46 million modernization of the City's three water treatment plants has provided Philadelphians with safer and better quality drinking water. The Torresdale Plant (renamed Samuel S. Baxter Plant) was completed in 1959; the Belmont Plant in 1965 and the Queen Lane Plant during the period 1954 to 1971. They are of the rapid-sand filter type, with automatic and semi-automatic controls. Although there is some variation in the method of treatment at the plants, the process consists of natural sedimentation, chlorination to destroy harmful bacteria and eliminate taste and odor producing substances, chemical treatment to enhance the settling of solid particles, flocculation, sedimentation where 90 percent of the impurities are removed, filtration, and finally, the addition of chemicals to ensure that the water remains pure as it travels from the plants to consumers.

The paramount concern of the Philadelphia Water Department is that water furnished to customers be healthful and free of contamination. Armed with the very latest in analytical equipment, skilled chemists and technicians examined 22,000 samples of water in 1985 collected from rivers, plants, reservoirs and 85 consumer locations throughout the City. To safeguard the water and ensure quality, each sample underwent an average of five tests for a total of 110,000 analyses. The validity of data produced by the Water



*A cool drink on a summer day in Fairmount Park.*

*The Fairmount Water Works, in the foreground, and the Philadelphia Museum of Art, as seen from the west bank of the Schuylkill River.*



Department is ensured by EPA inspection and certification of the ability of the utility's Bureau of Laboratory Services to perform all analyses required by the primary drinking water regulations, with the exception of testing for radionuclides which is performed by a private laboratory.

To protect and improve water quality, the utility has initiated the following projects:

- In 1976, Philadelphia became the first American city to build a pilot plant to determine the best methods for removing trace organics, tastes and odors from water. Located in the Baxter Plant, the pilot facility used both regular treatment and non-conventional treatment, such as carbon filters, ozone, polyelectrolytes, and macroreticular resins. A state-of-the-art Trace Organics Laboratory, also at Baxter, monitors the results of the tests.
- The Department has covered its open reservoirs to protect drinking water from taste and odor causing algae. In 1975-76, it placed floating covers on the north and south basins of the Oak Lane Reservoir; and, in 1981, the Department began installing four million square feet of synthetic rubber liner and reinforced nylon cover on the north basins of the East Park Reservoir. Completed in the fall of 1985, it is one of the largest municipal lining/cover sites in the world.
- The Department reduced the level of trihalomethanes (THMs) in the finished water by changing the chlorination points in all three plants. Trihalomethanes are formed when natural and man-made organic materials in water combine with the chlorine used to disinfect drinking water. Chloroform, the major component of THMs, is a probable human carcinogen based on animal studies. For this reason, in 1979, EPA set the Maximum Contaminant Level (MCL) at 100 parts per billion (ppb) for total THM in drinking water. To reduce the level of THM in its finished water, the Water Department began research in 1978. As a result of these studies, total THMs were reduced well below the MCL established by federal regulations.
- In 1983, the Department began a major renovation of the Queen Lane Water Treatment Plant's chemical storage facilities and the installation of a computer based control system. The most important aspect of this renovation will be the installation of a

new sodium hypochlorite disinfection system to replace individual one ton cylinders containing chlorine. The \$9,870,000 project will be completed in 1986.

- The Department initiated a Taste and Odor Project in 1983 to determine the nature and extent of tastes and odors in Philadelphia drinking water. The challenge was to develop an objective, universally accepted taste and odor method to achieve the project's purpose. One approach has been to refine the Flavor Profile analysis method, originally developed for testing in the food industry. In addition to using trained panelists for sensory testing of water, the department is using sophisticated instrumental analysis to detect possible odor causing compounds.

### *Philadelphia's Water Supply*

Philadelphia's drinking water sources originate on the slopes of New York's Catskill Mountains and in the mining and farm country north of Pottsville, Pennsylvania, where underground springs surface in small creeks that become part of a larger network of freshets, streams and tributaries flowing south. Eventually, they form the Schuylkill and Delaware Rivers. Compared to the mighty Mississippi which drains 40 percent of the United States, the entire Delaware River Basin is small, draining less than one percent of the land. Yet its waters serve one-tenth of the United States population and one-sixth of the nation's industries.

At the headwaters of the Delaware, its east and west branches and their tributaries fill three huge reservoirs that provide 50 percent of New York City's drinking water. Under a series of Supreme Court decrees, New York was required to release water from these reservoirs to maintain specified minimum streamflows in the Delaware River. These releases were important in the spring of 1985 when nine months of below-average rainfall caused record low stream flows and reservoir levels. On May 13, 1985, the Delaware River Basin Commission declared a drought emergency with mandatory restrictions on non-essential water uses. The Department's Planning and Research Unit worked closely with the new Customer Affairs Division to educate consumers about the drought emergency; reduce traditional summertime water waste, especially the illegal opening of fire hydrants; and provide information on water conservation.

Water Department figures indicate the success of the plan to manage the 1985 drought emergency:

- Peak summertime water use in 1985 fell 15 percent to 390 million gallons daily (MGD) from 460 MGD.
- Average residential use dropped 3.9 percent from average use in past years.
- Average summer hydrant abuse fell 51 percent to 20 million gallons from 41 million gallons.

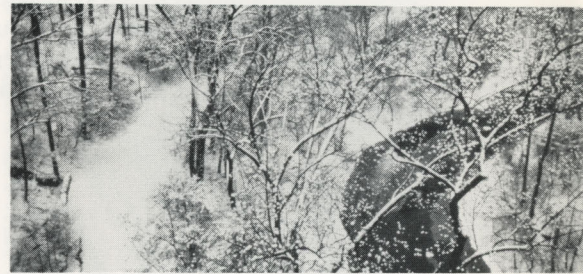
### *Cleaning Up River Pollution*

In 1985, the Philadelphia Water Department pumped an average of 194 million gallons daily (MGD) from the Delaware River and 157 MGD daily from the Schuylkill River to supply the city and parts of Bucks County with drinking water. To understand the direct relationship between the quality of these river waters and their treatment in the department's three filtration plants, we must look at the history of both rivers.

During the colonial period in the Delaware Basin, wells and water courses were freely used by early settlers without treatment. As industry grew, the ground water became saturated with wastes and many wells became unsafe. In 1793, more than one-half of Philadelphia's population fled the city when disease resulted from well contamination and killed nearly 5,000 people. As a result, in 1812, the City built the Fairmount Waterworks which pumped water directly from the Schuylkill River. At the same time, Philadelphia was building its first sewers to carry off rainwater and wastes.

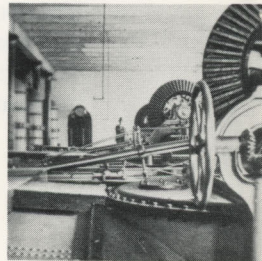
From 38 miles of sewers in 1854, the system grew to 848 miles by 1900. The untreated wastewater from this collection system entered directly into both the Schuylkill and the Delaware Rivers. The City soon realized that collecting wastewater in sewers without treatment simply converted a domestic nuisance into a public health threat.

In response to demands for action to reduce the pollution, the Pennsylvania legislature authorized the Commonwealth Department of Health to control sewage discharges by permit in 1905. Philadelphia launched a study of the sewage disposal problem and, in 1909,



*A winter view of Wissahickon Creek and  
Forbidden Drive.*

*Some of the water turbines, installed at the  
Fairmount Water Works between 1851  
and 1871, still exist.*



opened an experimental sewage treatment plant at the mouth of the Pennypack Creek to test all available treatment processes. It was not until 1916 that City Council appropriated \$3.2 million to purchase a 500-acre model farm near Fort Mifflin, and 165 acres of land near Wheatsheaf Lane and Richmond Street for the construction of wastewater treatment plants. The Northeast Plant was completed in 1923. Well into the 1940's, wastewater treatment was minimal, and 85 percent of the city's sewage was being dumped into the rivers with no treatment. "You can stand on Broad and Chestnut Streets and smell the rivers," complained a local editor in 1944. Meanwhile, industry along the Delaware and Schuylkill was contributing its share of pollution. Food processing plants, urban sewage, and farmland runoff also overloaded the river with phosphates, nitrates, and other pollutants.



### *Philadelphia's Commitment to Environmental Cleanup*

In 1946, the City launched an \$80 million sewer improvement and treatment program financed by sewer rental charges and revenue bonds. Under this program, the Northeast Water Pollution Control Plant was modernized and expanded in 1951, to provide both primary and secondary treatment. The Southwest and Southeast Plants which opened in 1954 and 1955, respectively, offered primary treatment, removing 35 percent of biochemical oxygen demand from the wastewater.

The Clean Water Act of 1972 required all publicly-owned treatment facilities to provide secondary treatment (removal of 85 percent of the biochemical oxygen demand from the wastewater). Congress included in that law a federal water pollution control grant program to provide up to 75 percent funding for construction of eligible projects. Action on the Water Department's upgrading plan was delayed by changing state and federal regulations and by the partial impoundment of federal funds. Work on the plan itself continued and, when those funds were released by the courts in 1975, Philadelphia was ready to break ground for construction of the Southwest Plant.

In March 1978, after three years of discussion between EPA and the Water Department concerning plant construction schedules, eligible funds and the timely processing of grant applications, negotiations broke down. The City sued EPA and, in turn, EPA and the Commonwealth of Pennsylvania sued the City. The cases were

*Mill Creek, looking northwest at 47th Street and Haverford Avenue, was re-routed into a sewer in 1880.*

consolidated in the Federal Court for the Eastern District of Pennsylvania.

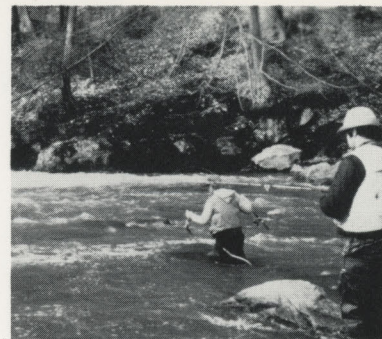
On May 30, 1979, after six months of intensive negotiations, the City of Philadelphia and EPA signed a "consent decree" calling for specific construction dates, reaffirming a previous commitment to stop ocean dumping of sludge by December 31, 1980, and creating a Philadelphia Environmental Trust Fund. This fund, established by the City's deposit of \$2.2 million, is being used by Philadelphia to undertake environmentally beneficial projects not currently required by law.

Because of inflation and new federal requirements, estimated costs of expanding and modernizing the wastewater plants have been climbing steadily. From \$80 million in 1968, they are now expected to total \$810,400,900. The current breakdown is as follows:

Southeast Water Pollution Control Plant	\$160,556,480
Southwest Water Pollution Control Plant	\$292,457,267
Northeast Water Pollution Control Plant	\$357,387,053

The huge expenditure of money for upgrading the wastewater treatment plants, and improvements made by other municipalities and major industries along the Delaware River is finally beginning to pay off with markedly improved water quality. This improvement, combined with the modernization of the City's three water treatment plants, has provided Philadelphians with a safer and more satisfactory drinking water.

Today, the Philadelphia Water Department is in an excellent position to provide further regionalization of its water, wastewater, and sludge management systems into the surrounding areas in Pennsylvania and New Jersey. The framework for this regional environmental engineering has already been established through the Department's wholesale agreements with the Bucks County Water and Sewer Authority and the Delaware County Regional Water Quality Control Authority.

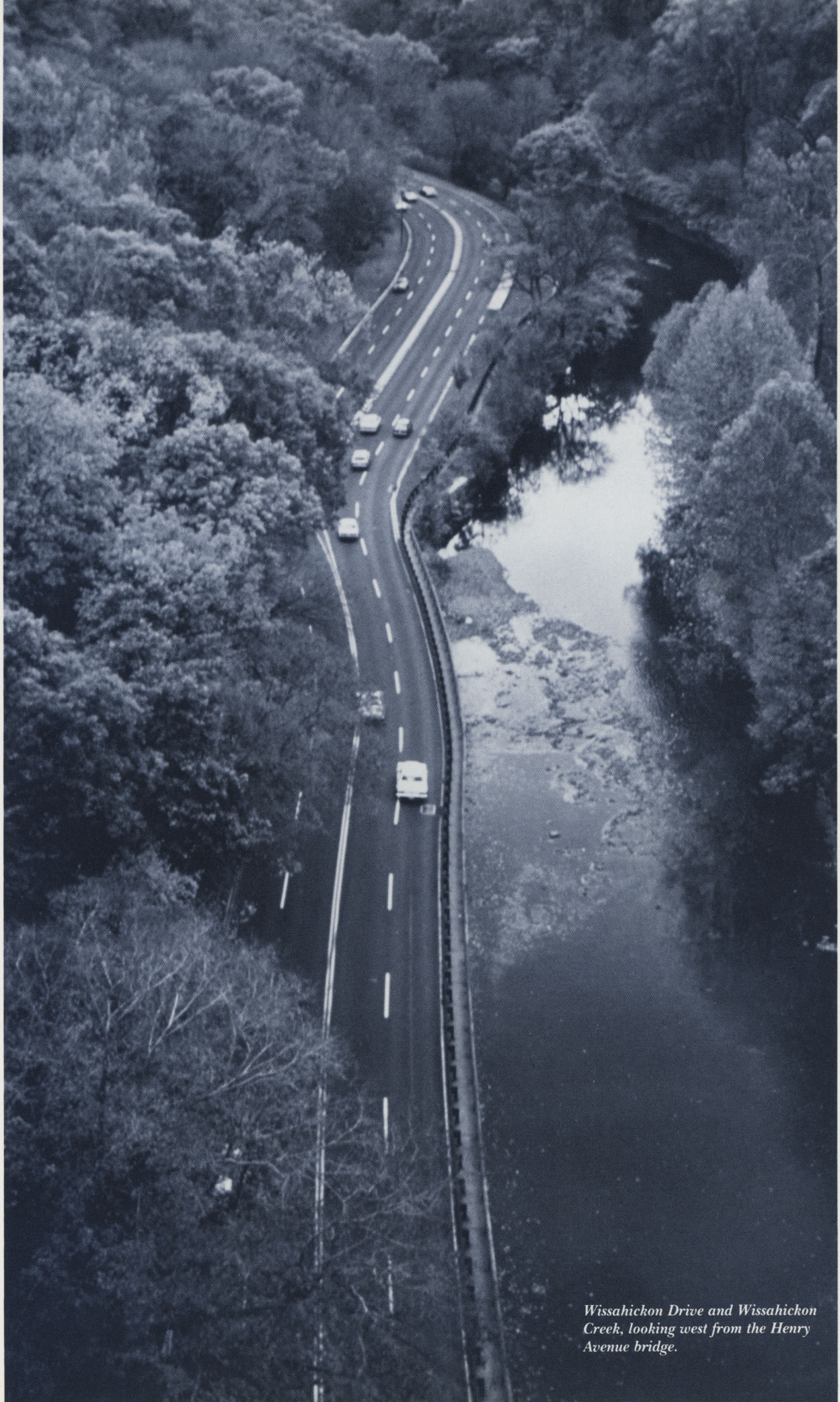


*The Wissahickon Creek is a favorite fishing spot.*

*Two cryogenic units at the Southwest Water Pollution Control Plant can each produce 90 tons of liquid oxygen per day for the aeration process.*

WATER: THE LIQUID OF LIFE





*Wissahickon Drive and Wissahickon  
Creek, looking west from the Henry  
Avenue bridge.*

## OPERATIONS DIVISION

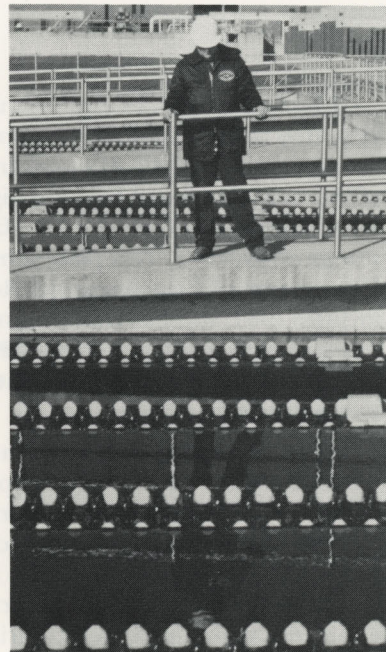
The Water Department's management approach recognizes the interrelationships among its various operating and support divisions. A good example of this is the coordination needed to achieve the reduction in unaccounted for water through a vigorous leak detection program. Under this program, expenditures for water main replacements have been prioritized by the Planning and Engineering Division through the development of a computerized management information system using data from the Water Pollution Control Division's sewer infiltration/inflow studies and wastewater surveys as well as Water Operation's water main break records. Through its leak detection program, Water Operations located and abated an estimated 15.1 million gallons per day of leakage during Fiscal Year 1985. Traditional summertime water waste, particularly unauthorized opening of fire hydrants, was reduced by a vigorous consumer education program coordinated by the Customer Affairs Division.

### *Wastewater Treatment*

The wastewater system is divided into three drainage districts, each served by a treatment facility. Efficient maintenance and operation of the treatment plants is a matter of primary importance for department management. A three-year program has been instituted to develop and implement preventive maintenance practices at the three plants. Training programs also have been inaugurated to train staff in the operation and maintenance of new equipment.

The benefits of the modernization program have never been more apparent than at the first plant to be completed, the Southwest Plant. While handling an average flow of 180.9 million gallons daily (MGD), 61.1 MGD of which were from townships outside Philadelphia, the plant removed 88.3 percent of the suspended solids and 87.2 percent of the biochemical oxygen demand during Fiscal 1985. At the Southeast Plant which treated an average flow of 89.2 MGD, interim consent decree requirements were exceeded. The largest of the three plants, the Northeast Water Pollution Control Plant, treated an average of 165.3 MGD while removing 75 percent of suspended solids and 76 percent of biochemical oxygen demand.

When the new primary and final sedimentation tanks were placed in service in November 1984, Northeast Plant performance began to improve and the maintenance downtime on the older tanks was reduced substantially. The seven aeration tanks became available in Fiscal 1984 and corrections to construction problems on the rotation biological contractors were initiated in Fiscal 1985.



*An operator checks final sedimentation tanks at the Southwest Water Pollution Control Plant.*



*The Southwest Influent Pumping Station uses three of these 8.5 foot diameter, double helix, two stage screw pumps.*

## *Facility Plan for Sludge Management*

The City generates approximately 35,000 dry tons of sludge each year at its three wastewater treatment plants. This quantity is expected to increase to 110,000 dry tons annually by 1986, when completion of the new plants will provide higher levels of solids removal. The Water Department developed a facility plan to handle this additional sludge production. This plan, submitted to EPA and The Pennsylvania Department of Environmental Resources for funding and approval in June 1984, summarized findings of the department's extensive research into environmental effects, comparative costs, economic benefits, and ease of implementation of alternative methods of sludge management.

Most of the sludge management methods which have been evaluated since the City of Philadelphia terminated ocean disposal of sludge in 1980, can be grouped into five major technology categories: Composting, Incineration, Coincineration (with municipal solid waste), Landfilling, and Residue Fusion (Ecorock). During the evaluation process, many concerned individuals and groups expressed their views on the various technologies, at workshops and public meetings held in Philadelphia and in western Pennsylvania.

The approval plan calls for centrifuge dewatering of digested sludge followed by composting, and properly regulated land application of compost to make use of its soil nutrient properties. These functions will be performed at the New Sludge Processing and Distribution Center adjacent to the Southwest Plant. Because this new facility will use innovative and alternative technology, the \$74 million cost will be eligible for 85 percent EPA construction grant funding.

## *Composted Sludge Production*

Due to the limitations of interim dewatering equipment, the Southwest Composting Pad processed 30,624 dry tons of sludge cake in Fiscal 1985, approximately the same amount as was processed the previous fiscal year. The processing is not meeting the current demand for the material. Delchem Sales Inc., currently in the fourth year of a five-year agreement with the department, marketed approximately 8,300 tons of sludge cake. Screened composted material was sold to landscapers and golf courses in bulk as "Earthlife." The bulk application program, expanded to replace the liquid sludge

application program, utilized 26,000 dry tons of composted material on ballfields, recreational areas, and farms in New Jersey and Pennsylvania.

Public acceptance is crucial to the success of any sludge management program and cannot be secured solely by technical improvements or research into health effects. Although careful and enlightened state regulation of sludge use is essential to improve public perception of management, the Department recognizes that it has the primary responsibility for fostering favorable public attitudes.

### *Collector System Maintenance*

For many years the department has been reconstructing and extending its collector (sewer) network. Of the 2,933 miles in service, nearly one-quarter have been built since 1953. The budget for this work has doubled since 1976 to keep up with the aging systems. During Fiscal 1985, about 7.7 miles of sewer lines were installed to serve new homes and industries, replace old lines, or relieve storm flooding. The 50 sewer projects completed during Fiscal 1985 are valued at more than \$33 million. Maintenance crews, that keep both wastes and stormwater flowing through the city sewers, were reorganized during Fiscal 1984 to increase work efficiency and flexibility.

Since 1968, when the job of cleaning 75,000 sewer inlets was transferred from the Streets Department to the Water Department, crews have responded to hundreds of thousands of requests for service. The responsibility for cleaning and maintaining 537 inlets in Fairmount Park was given to the Water Department in 1972.

In Fiscal 1969, with 235 laborers and 20 vehicles, the Water Department cleaned 26,934 inlets mechanically and 50,418 manually. By comparison, in Fiscal 1985, Inlet Cleaning with 30 vehicles, 30 Heavy Equipment Operators and 40 Laborers cleaned 50,450 inlets mechanically and 8,509 manually, removing more than 1.36 million cubic feet of debris.

Missing or stolen inlet covers have become a citywide problem. In Fiscal 1985, crews replaced 3,250 missing covers and installed 1,222 locking covers. The use of round concrete inlet covers has proved successful in areas where metal covers are frequently stolen. The computerized complaint system and work history of inlets cleaning was operative in three work districts in 1985; the remaining three are scheduled to come on line in Fiscal 1986.



There are 14 major collector systems and 174 regulator units in the Philadelphia sewer system. The regulating chambers divert flow from "combined" sewers to wastewater plants in dry weather, but bypass a portion of the swollen flow to the rivers during heavy storms. Approximately 1600 miles of combined sewers carry both sanitary wastes and storm water in the same pipe. The Interceptor Services Unit performed 8,819 inspections during Fiscal 1985, a 2 percent increase over the previous year. As a result of these inspections, 318 blockages of regulators were found and corrected, preventing unnecessary pollution of the rivers.

In 1982, the EPA promulgated final limitations for the discharges from the electroplating and metal finishing industries. Compliance was mandated by the spring of 1984. The Industrial Waste Unit launched an intensive metal finishers sampling program early in 1984 which will continue indefinitely. Each of the 49 metal finishers in the city is sampled to provide a data base that can be reviewed to determine compliance.

In Fiscal 1985, inspectors also collected 1,738 composite or grab samples of wastewater, the basis for levying \$3.5 million in surcharges on industrial wastes with strengths above the specified limit. The industrial surcharge, authorized under a 1977 ordinance, imposes strict limits on the discharge of heavy metals, oils, greases and other substances by Philadelphia industries to help the city meet federal standards for wastewater plant effluents, improve sludge quality for land application, and protect the department's plants from treatment upsets.

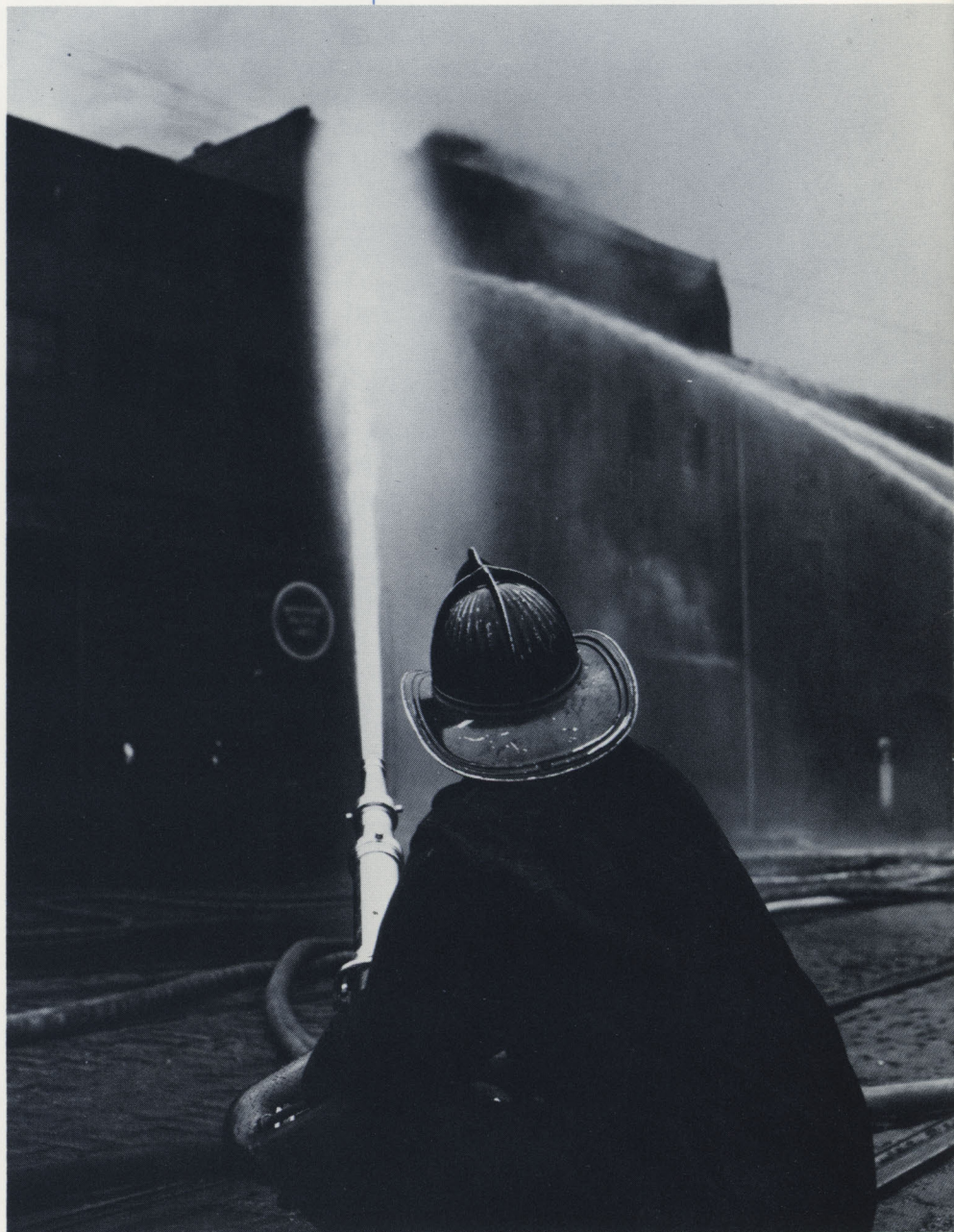
There are eleven townships bordering the City of Philadelphia that discharge into the City's sewer system and treatment plants through 35 connections. Bills, amounting to \$13.6 million during Fiscal 1985, are based on both the flow and strength of the sewage in accordance with contracts that have been negotiated with each township. During 1985, twelve township connections were chosen for standardization of billing through a six year averaging method.

*The TV camera being held by Ezzard Phillips is used to scan sewers to determine condition.*



*Henry Phillips Fountain at the Philadelphia Museum of Art.*

*Philadelphia's 3,278 miles of water mains and 26,720 fire hydrants provide excellent fire protection and potable water.*

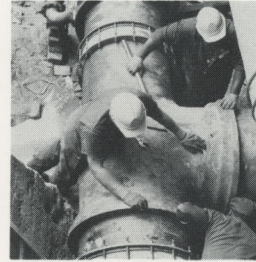


## *Water System Maintenance*

Maintaining the 3,278 miles of water mains, 81,921 valves, and 26,720 fire hydrants is a constant challenge to distribution crews, particularly in sub-freezing weather. In Fiscal 1985, they repaired 834 broken water mains compared to 993 the year before.

Illegal use of fire hydrants continued to be a major problem in hot weather, necessitating the installation of 1556 locking devices on hydrants during the summer. As a result of vandalism and normal wear, maintenance crews repaired 8,381 hydrants in Fiscal 1985.

Of the 31,474 delinquent water and sewer accounts serviced, 14,467 were shut off and the amount owed was collected by special crews.



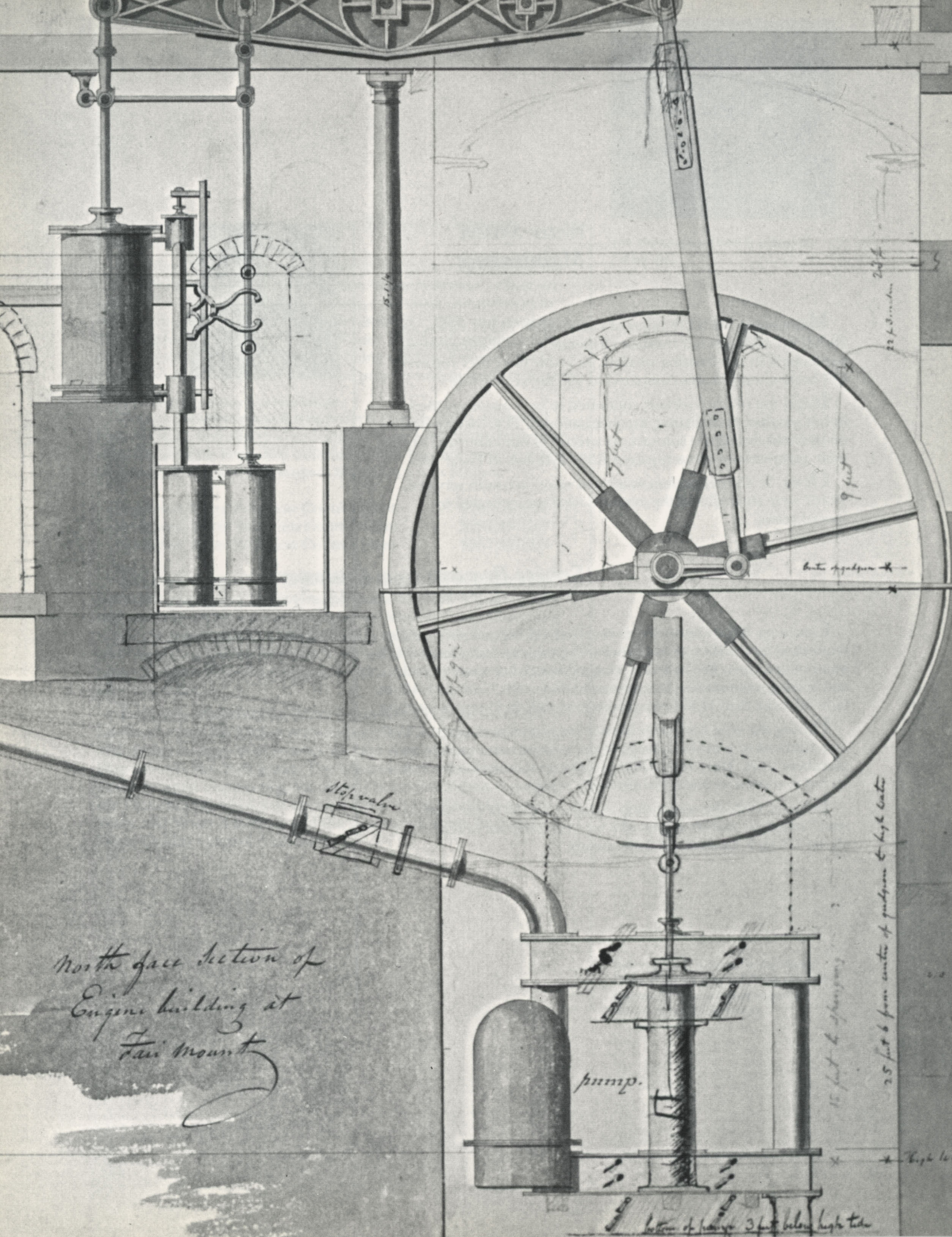
*Skilled workmen, with years of experience, repair a 30 inch water main.*

## *Service Requests from Customers*

Customer Affairs interviewers received 113,548 telephone calls requesting information or assistance with problems including broken water mains, open fire hydrants, clogged inlets, low water pressure, and leaking water meters. In response to these calls, Customer Affairs radioed more than 11,874 complaints to mobile field representatives.

During the year, Customer Service inspectors performed 63,507 investigations of permits, billings, leaks, missing water meters, and plumbers' work. More than 3,802 plumbing violations notices were served to owners to make the necessary repairs.

In Fiscal 1985, the meter shop installed 35,336 of the "easy to read," magnetic meters as part of a ten year program to replace all the 5/8 inch mechanical drive meters.



North face section of  
Engine building at  
Fair Mount

Stop valve

pump.

Center of gudgeon & high water

15 feet to springing

25 feet 6 from center of gudgeon to high water

bottom of frame 3 feet below high tide

High tide

## *Building and Plant Maintenance*

The Water Department maintains all of its own plants, pumping stations and related systems. The fact that there are 89 separate facilities with more than 3.7 million square feet of floor area, 35 miles of fencing, 615 cars and trucks, 1,000 pieces of off-the-road equipment, and a 25 ton crane, indicates the sheer magnitude of the maintenance function. By 1987, more than 500 persons may be involved in the collective maintenance effort. Therefore, the Department has developed a plan to reorganize the entire maintenance function to improve the efficiency and the ability to handle maintenance work in a cost effective manner. This means a consolidation of human and physical resources backed up by an effective management control system.

## P L A N N I N G   A N D   E N G I N E E R I N G

The Planning and Engineering Division provides engineering support for the entire Water Department including: project planning, surveying, design, cost estimating, and construction management; the management of the Capital Improvement Program and the administration of the program to reconstruct and expand the three wastewater treatment facilities; strategic planning associated with long-term operations of the department; and the responsibility of providing all of the department's laboratory and computer services.

## *Design*

During Fiscal 1985, the utility's Design Branch prepared plans, specifications and cost estimates for 114 projects valued at \$28.7 million. They also coordinated and reviewed another 25 projects valued at \$8.1 million, designed by the department's engineering consultants. The projects included rehabilitation contracts at the three water treatment plants, as well as distribution mains and sewers.

*An engineering drawing by Frederic Graff, showing a section of the Engine Building at the Fairmount Water Works.*

## *Construction*

The Water Department's Construction engineers are responsible for examining and measuring building materials and checking construction techniques to make sure contractors meet all contract specifications. In Fiscal 1985, they supervised 217 projects with a combined value of \$123.7 million. Of these, 97 were completed for \$36 million; 147 projects valued at \$101 million remain active.

## *Materials Testing Laboratory*

To help municipal departments obtain full value for their dollars, the Materials Testing Laboratory made 187,831 tests on 5,640 samples of materials purchased by the City or used by contractors in municipal construction. Physical and chemical tests were made on a wide range of materials, including asphalt, textiles, paints, concrete, water meters, soils, paper, and chemicals.

## *Computer Center*

Thanks to the Water Department's Hewlett Packard 3000/68 Computer, the engineering units save time and money on planning and design. The computer turned out a variety of complex graphs, tables, calculations and reports, that would have been too time consuming if done by engineers. Operating units also benefited from a steady stream of computerized data on plant operations, chemical usage, water quality, fire hydrant repairs, inlet cleanings, and sewer surcharges for townships.

## *Cleaning Up the Enterprise Avenue Landfill*

During the 1970's, several waste hauling firms illegally disposed of more than 11,600 drums of toxic wastes on 40 acres of land leased for the disposal of incinerator residue. This land, known as the Enterprise Avenue site, is located adjacent to the Southwest Water Pollution Control Plant.



*A workman completes installation of reinforcing steel for an aeration tank at the Southeast Water Pollution Control Plant.*

*Today's Assurance of Quality*



*The three central figures of the fountain at Logan Square symbolize the Delaware, Schuylkill and the Wissahickon waterways.*



*Engineers check the construction work for \$10 million of improvements to the Queen Lane Water Treatment Plant.*

During Fiscal 1982 and 1983, the Water Department spent more than \$8 million to remove all the drums, 21,000 tons of contaminated soil and 200,000 gallons of water from the site and to establish and monitor 68 groundwater wells.

Cleanup and closure of the site was completed in March of 1985 for an additional \$3.3 million, half of which was paid by EPA through the Superfund Program.

## MANAGEMENT AND FINANCIAL SERVICES

### *Organization Changes*

In September 1984, the Water Department moved the Design Branch, Computer Center and Administrative Offices to One Reading Center, a new office building at 1101 Market Street. At the same time, two new divisions were created.

*This beautiful waterfall, next to Wise's Mill Road, improves water quality naturally by aeration.*



- The Administration and Human Resources Division was organized to initiate human resource management philosophy and policy; improve relations with representatives of labor; improve employee relations, motivation, and effectiveness; and develop and improve safety policies.
- The Customer Affairs Division was created to ensure appropriate and reliable customer services and community relations; develop educational programs; maintain timely and effective communications and liaison with government, civic organizations and the media; and identify and develop commercial sales markets.

### *Alternate Capital Financing*

In 1983, the department began to seriously study the potential of alternative capital financing plans necessary to support the massive upgrading of the three water pollution control plants at the lowest possible cost. This study led to the department's successful entry into the low interest, short-term commercial paper market in July 1984, with the sale of \$124 million in Revenue Anticipation Notes.

### *Rate Increases*

On July 1, 1983, the department adopted a new equitable, conservation oriented rate structure by charging its retail customers only for the amount of water used, over and above the fixed service charge. Prior to this change, each customer had to pay for a minimum amount of water regardless of use.

Although the 1983 rate increase was planned to last for only one year, by surplusing some \$33.6 million in operating budget allocations alone, the department was able to delay the imposition of higher rates for more than two years. New sewer rates effective January 10, 1986 increased the typical residential, water and sewer quarterly bill to \$78.95 from \$65.98, or by 20 percent. The major reason for the increased revenue requirements was the reconstruction and higher operating costs of the three wastewater treatment plants to comply with the Federal Water Pollution Control Act.

CONSOLIDATED SUPPLEMENTAL SCHEDULE OF RATE  
COVENANT COMPLIANCE FOR THE FISCAL YEAR ENDED  
JUNE 30, 1985 (Amounts in Thousand of Dollars) (Legally Enacted Basis)

LINE NO.

1	Total Operating Revenue	\$203,300
2	Net Operating Expense	<u>111,214</u>
3	Net Operating Revenue	92,086

*Debt Service:*

4	Revenue Bonds Outstanding	76,254
5	General Obligation Bonds Outstanding	<u>19,387</u>
6	Total Debt Service on Bonds	<u>95,641</u>
7	Net Operating Revenue after Bonds	(3,555)

*Nonoperating Income:*

8	Interest Income	29,756
9	Grant Income	<u>3,145</u>
10	Total Nonoperating Income	32,901

*Other Obligations:*

11	Direct Interdepartmental Charges	18,398
12	Transfer of Interest Income to General Fund	4,138
13	Renewal and Replacement Fund	8,731
14	Repairs and Maintenance Financed from Revenues	<u>931</u>
15	Total Other Obligations	32,198
16	Net Operating Balance for Current Year	(2,852)
17	Net Balance at Beginning of Fiscal Year	<u>55,575</u>
18	Net Balance at End of Fiscal Year	52,723

MALISH + PIVEN

*Photographs on cover and pages 6 (top), 8, 10, 16 (top), 21 (left), and 22, courtesy of Peter Odell.*

*Photographs on pages 2 (top), 9, and 11 courtesy of Charles Cook.*

**CONSOLIDATED SUPPLEMENTAL SCHEDULE OF RATE  
COVENANT COMPLIANCE FOR THE FISCAL YEAR ENDED  
JUNE 30, 1985 (Amounts in Thousand of Dollars) (Legally Enacted Basis)**

Pursuant to Section 4.03(b) of the General Water and Sewer Revenue Bond Ordinance of 1974 (Bill No. 1263), the City is required to impose, charge and collect in each Fiscal Year rates and charges at least sufficient, together with that portion of the unencumbered amount of the operating funds balances available and reserved for appropriation for the payment of Operating Expenses at the commencement of such Fiscal Year, which together with all other project revenues to be received in such Fiscal Year, shall equal not less than the greater of:

**A.** The sum of:

- (i) all Net Operating Expenses payable during such Fiscal Year;
- (ii) 150% of the amount required to pay the principal of and interest on all Bonds issued and outstanding hereunder which will become due and payable during such Fiscal Year; and
- (iii) the amount, if any, required to be paid into the Sinking Fund Reserve during such Fiscal Year; or

**B.** The sum of:

- (i) all Operating Expenses payable during such Fiscal Year; and
- (ii) all Sinking Fund deposits required during such Fiscal Year in respect of all outstanding Bonds and in respect of all outstanding general obligation bonds issued for improvements to the water or sewer systems and all amounts, if any, required during such Fiscal Year to be paid into the Sinking Fund Reserve.

Coverage is computed as follows:

**Coverage A**

Line 3	92,086
+ Line 10	32,901
+ Line 17	<u>55,575</u>
	180,562
÷ Line 4	<u>76,254</u>
	2.37

**Coverage B**

Line 3	92,086
+ Line 10	32,901
- Line 11	(18,398)
- Line 14	( 931)
+ Line 17	<u>55,575</u>
	161,233
÷ Line 6	<u>95,641</u>
= Coverage B	1.69

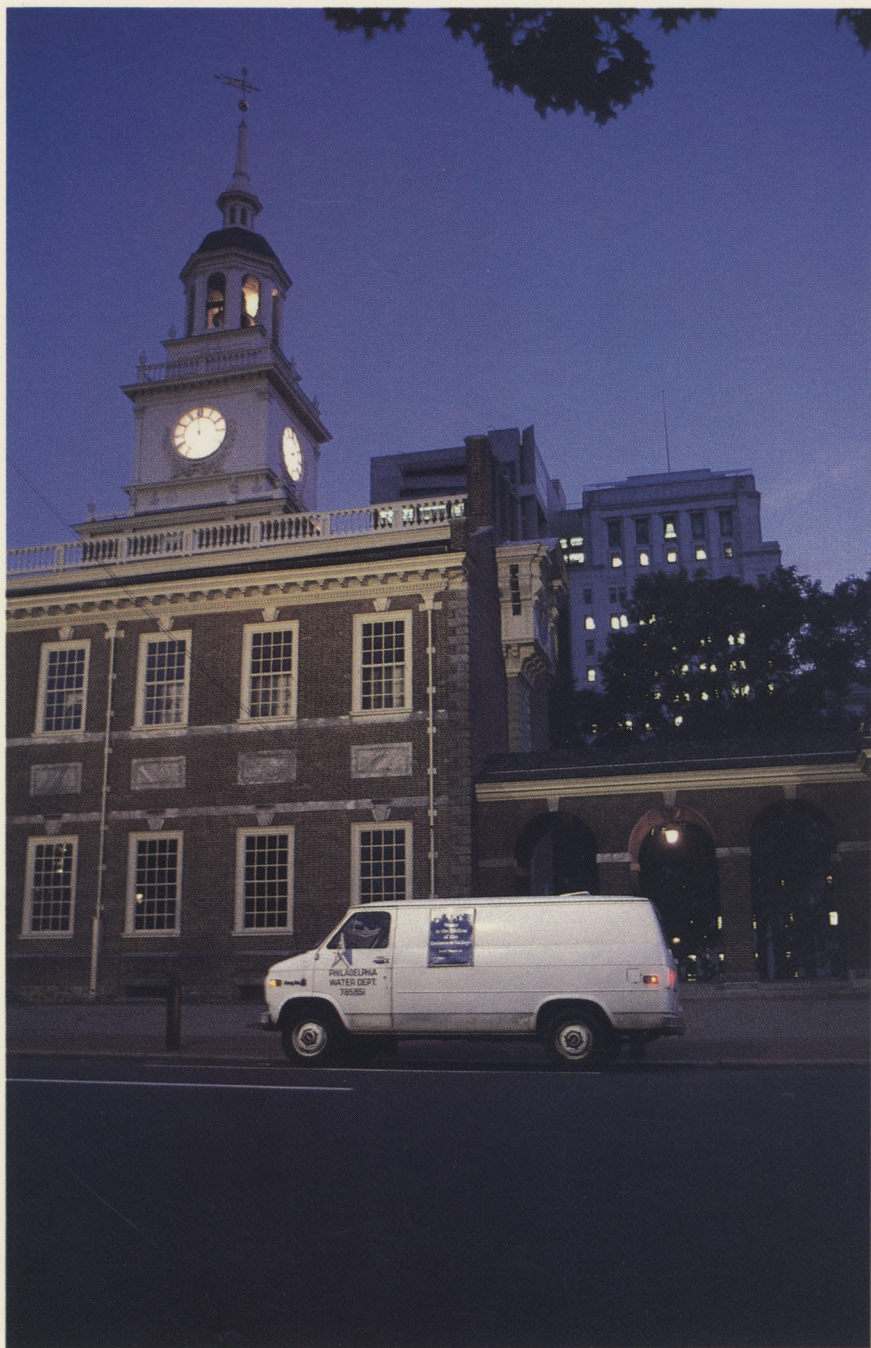
**WATER AND SEWER FUNDS**

***Assets Fiscal Years Ended June 30, 1985 and 1984  
(In Thousands)***

	<u>1985</u>	<u>1984</u>
Current Assets	158,258	143,268
Restricted Assets	204,319	101,129
Property, Plant and Equipment	<u>1,269,839</u>	<u>1,224,021</u>
	1,632,416	1,468,418

***Liabilities And Fund Equity Fiscal Years Ended  
June 30, 1985 and 1984 (In Thousands)***

	<u>1985</u>	<u>1984</u>
Current Liabilities	96,605	70,767
Long Term Liabilities	939,026	837,781
Fund Equity	<u>596,785</u>	<u>559,870</u>
	1,632,416	1,468,418



*The Water Department is on-call for service throughout the city, 24 hours-a-day. Here a service van passes Independence Hall.*